

BWD

845

DC to 30MHz Dual Trace Variable Persistence—Storage Oscilloscope

Features

Storage:

> 1cm/ μ sec Writing Speed
Viewing and Storage Time to 50 minutes
0.2 to 50 seconds Variable Persistence
Manual or Auto Erase
Auto store with > 2 hour pretrigger waiting time
Auto Write—View—Erase Cycle
8 × 10 division Burn Resistant CRT
7.5KV EHT

Power Requirements:

AC, DC or Optional Battery Pack.

Vertical:

1mV to 20 volts/division Sensitivity
DC to 30MHz—3db Bandwidth
Display—Alternate, Chopped
 $\pm$ Add Ch. 1 or Ch. 2
Signal Delay.

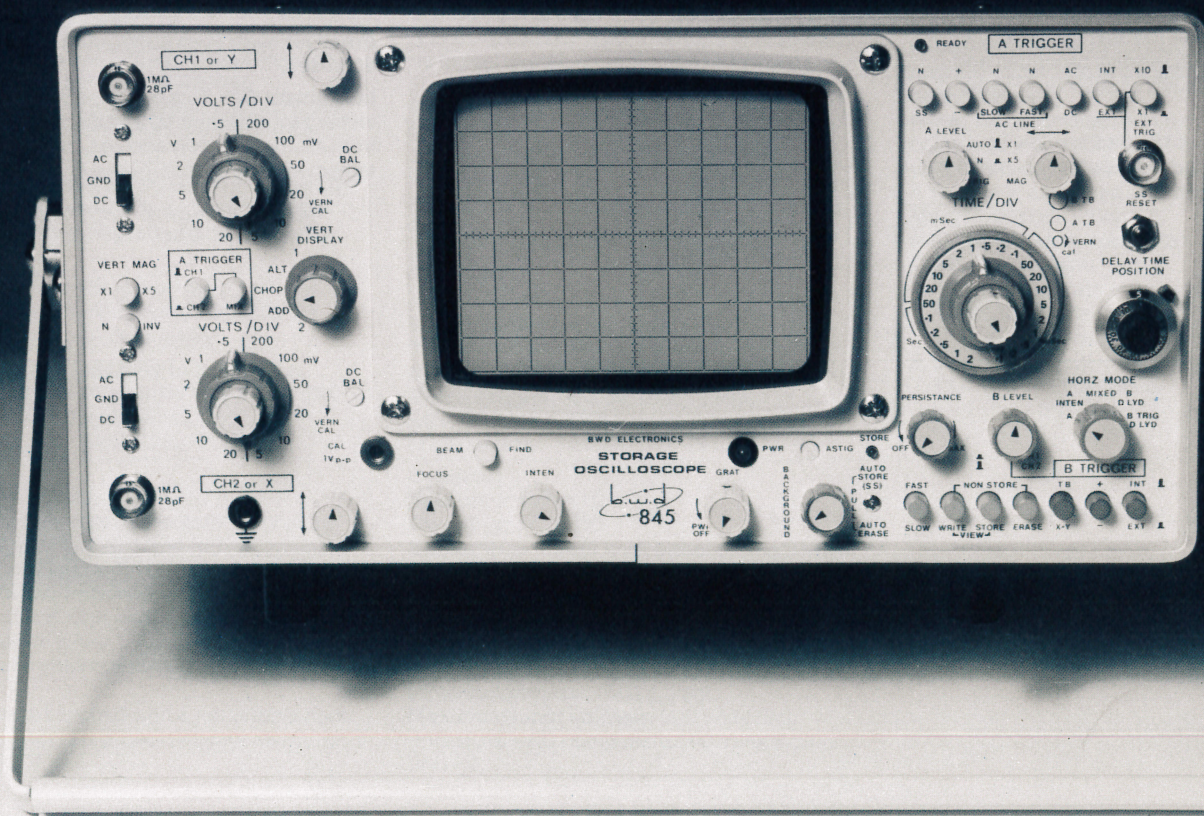
Horizontal:

20nsec to 10sec/div Main Time Base
20nsec to 2.5sec/div Delayed Time Base
DC to 30MHz Trigger
Intensified, Mixed, Delayed or
Delayed Trigger Displays.
Identical X-Y DC to 1MHz.
1° Phase shift DC to 100kHz.

Applications

R&D, test or service in:

Digital Systems
Bio-medical
Video—VTR's and TV
Audio
Industrial Controls
Business Machines and Calculators
Data Logging
Servo Systems
Communications



BWD Oscilloscopes—made to measure

The BWD 845 is a high performance, portable variable persistence, storage oscilloscope. It incorporates a delayed, mixed or triggered delayed time base, vertical amplifiers with a 1mV sensitivity on both channels and can be powered by AC, DC or an optional battery pack.

The variable persistence/storage facility enables the user to view and mesure intermittent signals and transients that cannot be detected on a normal oscilloscope. It also retains waveforms at very slow sweep speeds allowing the entire waveform to be viewed rather than a moving dot. If persistence is adjusted to overlap traces, fast signals at low repetition rates can be integrated to make them readily visible. This technique makes it possible to view and store signals that are faster than the CRT writing rate, in fact up to 30MHz.

Storage oscilloscopes are more complex than non-store models, so several features have been incorporated to simplify the comprehensive facilities provided.

A standard feature of all BWD oscilloscopes is the ALL BUTTONS OUT condition for normal operation. This is incorporated in the BWD 845 and is a major contribution in simplifying operation.

An AUTO ERASE cycle eases the task of setting up the CRT controls in the storage mode. View time is approximately 4 seconds after each writing sweep is completed. It is then erased to await the next sweep. In the CHOP mode two traces may be written and viewed simultaneously or alternately in the ALT mode.

This mode may also be used for viewing repetitive single shot signals that contain non-repetitive waveforms.

When a long waiting time occurs before a signal is received to trigger the time base and write a stored display the complete screen may fade green. An AUTO STORE facility in the BWD 845 eliminates this problem by holding the CRT in the erase condition until the time base is triggered by a signal. It then automatically switches to store. An LED indicator signifies this condition. Depressing the viewing button enables the stored trace to be viewed. Auto store extends the pre-trigger period to hours instead of minutes.

The CRT characteristics, themselves, form the major control on writing speed and storage. The CRT has a burn resistant screen and operates at 7.5kV EHT to provide a well focused trace in all operating modes. To optimise its operation for both fast writing and long viewing/storage times, two switch selectable settings are provided—Slow or Fast. By writing in Fast then switching to the lower intensity Slow condition, storage or viewing times can be greatly extended. The backing electrode is also adjustable over a limited range by the front panel background control for best signal to background contrast.

The combination of these wide range storage and oscilloscope functions make the BWD 845 a very powerful tool for a wide range of measurement and analysis.

Storage Characteristics:

The CRT is burn resistant and operates at 7.5kV to provide a well defined display. Variable background control provides adjustment of storage background for user optimisation of writing or viewing level. Selection of seven operating modes for best display of waveform under observation.

Operating Modes:

Write, store, view, variable persistence, auto-store, auto-erase and non-store (conventional).

Storage Writing Speed:

Slow, 1cm/10μsec
Fast, < 1cm/1μsec. (Maximum speed 5cm/μsec over most of screen area).

Storage Time:

Slow, up to 30 minutes
Fast, > 15 sec at 1cm/μsec
> 3 min at 1cm/10μsec.

(Both times may be increased by switching to Slow after writing)
50 minutes at 20cm/msec by writing Fast and then switching to Slow.

Viewing Time: Similar to storage times. Maximum viewing time at lower brightness when switched to Norm.

Persistence: Non-store, similar to P31 phosphor (approx. 40μsec).

Variable: Approximately 200msec to 50sec.

Auto Store: Instrument held in erase condition ready to trigger and store a single event for minimum of 2 hours, typically 4 hours. Store time after trigger, up to 30 minutes at Slow writing speed. > 3 minutes at fast writing speed. Store condition indicated by LED indicator lamp.

Auto Erase: Instrument cycles continuously, Erase, 800msec.

Write, dependent on time base setting. Viewing, preset to 4 sec approximately.

Erase Manual: Push button control, erase time 800msec.

Instrument Off: With a trace stored and instrument switched off and disconnected from all power supply sources, trace will remain stored for up to 7 days.

Vertical Amplifiers:

Input attenuators precede the amplifiers to eliminate trace movement associated with amplifier gain switching. Negligible trace drift is achieved by a monolithic dual FET input stage and integrated circuit amplifiers. Identical X-Y operation is available with polarity inversion for the X co-ordinate. X-Y phase shift is corrected to less than 1° from DC to 100kHz.

Bandwidth: DC to 30MHz—3db

Referred to 8 div. deflection at 50kHz from 25Ω source with vernier to Cal position. 1 div =9.5mm.

AC coupling: > 2Hz—3db direct input or >0.2Hz with 10:1 probe.

Bandwidth: × 5 gain (1mV—4 Volt/div)
DC—25MHz—3db. AC coupling 2Hz—3db.

Rise Time: < 10nsec (5mV to 20 Volt/div). < 12nsec (× 5 gain) measured between 10% and 90% points on a 6 div input.

Sensitivity: (both channels) 5mV to 20 Volt/div in 12 calibrated steps (1, 2, 5, sequence). 1mV to 4 Volt/div at × 5 gain.

Calibration Accuracy: Within 3% at switch settings with vernier to cal. (5% at × 5 gain). Uncalibrated vernier continuously variable between steps, extends range to 50 Volts/div.

Input R & C: 1MΩ within 2% and 28pf within 2pf.

Maximum Input Voltage: 500 Volts (DC + Peak AC) AC component 500 Volts p-p maximum 1kHz or less.

Minimum Undistorted Deflection: 8 div at 30MHz.

Display Modes: Chan. 1, Chan. 2. Alt. Chop.±Add.

Chopping Frequency: Approximately 300kHz.

Delay Line: Permits viewing of leading edge of displayed waveform.

Trace Inversion: Push-push switch enables channel 2 to be inverted for display convenience or to provide a diffe ential input facility when two amplifiers are used in the ADD mode.

CMRR (in ADD Mode): At least 20db from DC to 20MHz. Common mode signal amplitude < 8div with one vernier adjusted for optimum rejection.

Noise: (Tangentially measured). Full bandwidth all sensitivities 0.05 division. ×5 gain <0.2div all sensitivities.

Channel 2 as X Amplifier in X-Y Mode: Bandwidth DC to 1MHz from 1mV to 50Volts/div referred to 6 div. deflection. Phase Shift: <2° from DC to 100kHz.

Probes:

2 × P32 duo probe.
The probes provided incorporate a 3 position slide switch for 1:1, 10:1 and REF off position. Oscilloscope bandwidth is unaffected by the probe in the 10:1 position. Input C and R is 11pf and 10MΩ. The bandwidth in the 1:1 position is limited to approximately 8MHz input C and R is 66pf and 1MΩ.

Each probe is supplied with a retractable hook tip, an insulating tip, a BNC Adaptor an I.C. tip and a trimmer tool.

Horizontal System:

The dual time bases incorporate several features to simplify operation and to maintain long term accuracy. Normal operation with AC coupling and positive selection of Channel 1 trigger is provided when all push buttons are out.

The dual concentric timing switches are interlocked to prevent false settings being selected. Time base accuracy is maintained by thick film timing resistors and selected high stability capacitors.

Time Base 'A' (Main or Delaying)

Sweep Rate: 100nsec to 2sec/div in 23 steps of 1, 2, 5, 10 sequence. Maximum sweep speed is 20μsec/div at × 5 magnification. A vernier control covers range between each step and extends range to > 5sec/div. **Note:** Vernier is operative on 'A' time base only when 'A' is selected. It is operative on 'B' time base in the intensified, mixed and delayed modes.

Sweep Accuracy: Measured over centre 8 div. of CRT.

× 1 Magnification	
+ 15 to +35°C	0—50°C
3%	5%
× 5 Magnification (excluding first 20nsec of display)	
+ 15 to +35°C	0—50°C
5%	6%

Calibrated Sweep Delay:

Delay time range: As sweep rate above. Delay time accuracy: 3% over calibrated range.

Delay multiplier: 0.5 to 10× time/division setting.

Delay jitter: 1 in 10,000 of maximum delay time (0.01%).

Multiplier linearity: < 1% of full scale.

'A' Time Base Sweep Modes:

Mode: Auto (with level select) Non-Auto or Single Sweep with reset button and ready lamp. Ready lamp indicates trace readiness prior to commencement of sweep in all operating modes. Trace free runs in Auto with no trigger signal.

Time Base 'A' Trigger:

Internal:

Source: Channel 1 or 2 or mixed displays or line or line frequency.

Coupling: AC or DC, Slow (or TV Frame) and Fast.

Slope: + or — with level select over 8 div.

Sensitivity:

0.3 div deflection DC to > 15 MHz increasing to 1 div deflection at 30MHz. In chopped mode trigger bandwidth is limited to approximately 1MHz.

Video Trigger: < 2 div of composite waveform to over full screen deflection for line or frame lock.

External:

Source: × 1 or × 10

Coupling: AC or DC

Slope: + or — with level select over ±3 Volts at × 10 and ±30 Volts at × 1.

Sensitivity: 100mV p-p DC to 15MHz, increasing to 500mV p-p at 30MHz.

External trigger bandwidth is not limited in chopped mode.

Input impedance: 1MΩ & 28pf.

Maximum input voltage: 500 Volts (DC +Peak AC). AC component 500 Volts p-p up to 1kHz.

Each time base has independent trigger source and polarity selection for maximum display flexibility particularly when dealing with digital signals. To simplify single shot operation when storage is in use, the erase button also resets the single shot circuit.

'B' Time Base (Delayed)

Sweep Base: 100nsec to 0.5sec/div in 21 steps of 1, 2, 5, 10 sequence. Uncalibrated vernier covers range between steps and extends range to at least 2sec/div.

Sweep accuracy: measured over centre 8 div of CRT.

× 1 Magnification	
+ 15 to +35°C	0—50°C
3%	5%
× 5 Magnification (excluding first 20nsec of display)	
+ 15 to +35°C	0—50°C
5%	6%

Time Base 'B' Trigger:

Internal:

Source: Channel 1 or 2.

Coupling: DC coupled.

Slope: + or — with level select over >6 div internal.

Sensitivity: 1 div DC to 15MHz 2 div., extends range from DC to 30MHz.

External:

Source: × 1 or × 10.

Coupling: AC or DC.

Slope: + or — with level select over ±3 Volts at × 10 and ±30 Volts at × 1.

Sensitivity: 200mV p-p 10Hz to 15MHz, 500mV p-p DC to 25MHz, increasing to 1 Volt p-p at 30MHz.

Mixed Sweep:

Accuracy: Identical to A and B sweep accuracy excluding 0.5 div of start of main sweep and 0.2 div. or 0.1μsec (whichever is greater) either side of transition from main to delayed sweep.

Note: Transition from A to B sweep is delayed compared to the time/div × multiplier setting until B time base reaches the same voltage as A time base and takes over the display.

Magnification: × 1 or × 5.

Maximum sweep speed: 20nsec/div.

Output waveform:

4mm sockets located on rear of BWD 845.

1. A time base gate +0.2 Volt to +4 Volt, 1KΩ source impedance.
2. B time base gate +0.2 Volt to +4 Volt, 1KΩ source impedance.

CRT:	Rectangular 8 × 10 div (1 div = 9.5mm) variable persistence storage. P31 Phosphor.	
EHT:	7.5KV.	
Graticule:	Internal, parallax free with variable illumination. Fitted light blue filter.	
Z Modulation:	2 Volt positive will blank trace at normal intensities from DC to > 10MHz input impedance 4.7k Ω and 10pf. Maximum input $\pm$ 30 Volt p-p.	
Trace Find:	Push button returns trace to within limits of CRT screen and over rules intensity setting.	
Calibrator:	Output, rectangular, positive going from ground 1 Volt p-p, 1kHz approx. Accuracy 1% + 15°C to +35°C, 2% 0 to 50°C.	
Output Waveforms:	A time base gate +0.2 Volt to 4 Volt 1k Ω source impedance. B time base gate +0.2 Volt to 4 Volt 1k Ω source impedance.	
Power Requirements:	AC 98 to 135 Volt and 195 to 270 Volt. Selection by changeover switch. 48 to 440Hz 40 Watts max. DC 20 to 30 Volt at 1.3 amps. Battery pack (optional) 4 hours per recharge. Battery charger incorporated in standard instrument. Recharging from AC or 32 Volt DC.	
Low Voltage Indicator:	When the voltage supply to the oscilloscope (AC, DC or battery) falls below correct operating level, the front panel indicator changes from a steady to a flashing mode.	
Environmental:	Specification is met within power supply range shown, above, from +5°C to +35°C and from 0% to 90% RH unless otherwise stated. Add 2% to specification for operation over 0-50°C. Storage -20°C to +70°C and 0% to 90%RH.	
Finish:	Instrument contained in a vinyl covered cabinet with offwhite panels.	
Dimensions:	175mm high × 345mm wide × 470mm deep overall. Height increases to 230mm with battery pack added.	
Weight:	Nett: Instrument 9.5kg. Battery pack 6.3kg. Packed: Instrument 12kg. Battery pack 8kg.	
Warranty:	The instrument is guaranteed for a period of twelve (12) months against faulty workmanship and materials except that the CRT is not guaranteed against screen or storage mesh burns. Refer to Conditions of Sale for further details.	
Accessories supplied:	1:1 and 10:1 Duo probe. Type P32 (2 off). Instruction and service manual including schematics.	
Options:	Battery Pack BP3.	
Optional Accessories:	1:1 and 10:1 Duo probe	P32
	100kHz—300MHz Demodulator probe kit	P34
	Folding viewing hood	H46
	Dust cover	
	Front panel protective cover	SC52
	Carrying case	C100
	Oscilloscope trolley	T61
	Cameras—Details on request	
Battery Pack:	The type BP3 pack is readily attached or detached from model BWD 845. It is fixed by two screws and connects via a plug to the rear panel socket. If desired the battery pack can be carried separately to the oscilloscope and is provided with a handle for this use. Recharge time of 14 hours provides approx. 4 hours running time.	

With a policy of continuous development variations in technical detail may occur.



Designed and Manufactured by

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